(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 091 151**
B1

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **25.06.86**

(51) Int. Cl.⁴: **B 61 H 15/00,** B 61 H 5/00

(21) Application number: **83200408.9**

(22) Date of filing: **24.03.83**

(54) **A rail vehicle disc brake caliper.**

(30) Priority: **05.04.82 SE 8202163**

(43) Date of publication of application:
12.10.83 Bulletin 83/41

(45) Publication of the grant of the patent:
25.06.86 Bulletin 86/26

(84) Designated Contracting States:
DE FR GB IT

(56) References cited:
EP-A-0 046 619
CH-A- 489 386
DE-A-1 960 066
US-A-3 189 128
US-A-4 234 064

(73) Proprietor: **SAB NIFE AB**
Box 515
S-261 24 Landskrona (SE)

(72) Inventor: **Stensson, Bo Göran**
Akardöds Gard
S-270 44 Brösarp (SE)
Inventor: **Severinsson, Lars Mattis**
S-310 21 Hishult (SE)
Inventor: **Lundström, Bo**
Stampgatan 7
S-252 41 Helsingborg (SE)

(74) Representative: **Petri, Stellan**
c/o SAB NIFE AB Box 515
S-261 24 Landskrona (SE)

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European patent convention).

Courier Press, Leamington Spa, England.

EP 0 091 151 B1

Description

Technical Field

This invention relates to a rail vehicle disc brake caliper, which includes a base frame with a pivotally attached brake lever and is to be suspended from an underframe or bogie of the vehicle, the end portions of the base frame and the brake lever, respectively, on either side of a disc to be braked being provided with brake pads on pad holders, a fluid operated brake cylinder, which acts on the brake lever, being attached to the base frame, and a slack adjuster of the rotary, lever type arranged with its rotary part on a shaft pivotally arranged on the base frame.

Background Art

A slack adjuster of the type referred to above is well known in the art and is normally used as a force-transmitting and slack adjusting means in automotive brake systems of the S-cam type frequently used for heavy vehicles, such as trucks and buses. Such slack adjusters were earlier manual but are nowadays more often automatic; both types are possible in the present case, but the automatic one is preferred.

Generally speaking, slack adjusters of this type have also earlier been used for railway disc brake purposes, a typical example thereof being shown in DE—A—1 960 066. More recently an automatic slack adjuster of the type in question specially adapted for railway purposes has been designed; such an adjuster is shown in US—A—4 234 064 and may be used in the present disc brake arrangement.

More specifically, a disc brake arrangement including a slack adjuster of the type referred to and constituting the closest prior art is shown in Figs 3 and 4 of EP—A—0 046 619.

Another example of a disc brake caliper of the general type referred to above but without any slack adjuster is shown in US—A—3 189 128. Such a disc brake caliper suffers from two main disadvantages: the leverage of the pivotable brake lever is in many cases too small, and it does not include any slack adjuster. If the leverage is increased without any other measure being taken, the space requirement will easily be too great, which also is true if the brake cylinder diameter is increased in order to obtain the higher brake force needed. Also, in this type of caliper it is difficult the build in the nowadays requires slack adjuster without unduly increasing the volume of the arrangement.

It has to be noted that the space available for a disc brake arrangement in the vicinity of the disc or wheel to be braked most often is extremely limited in modern designs, which of course makes the volume of the arrangement critical, but at the same time the brake force has to be high enough. Not even an arrangement according to EP—A—0 046 619 is optimal in these two respects.

The Invention

The somewhat contradictory requirements may be fulfilled and a disc brake caliper of the type defined above may be improved in that, according to the invention, the free arm of the slack adjuster is connected to the piston rod of the brake cylinder so that it both transmits the brake force and adjusts the slack and the shaft is provided with a radial projection, which is force-transmittingly connected to the brake lever.

It is obvious that a slack adjuster of the rotary, lever type makes it possible to attain an increased leverage and an extremely compact disc brake caliper. Due to the fact that slack adjusters of this type are produced in large quantities for the demanding automotive industry, a cheap and reliable design may be obtained.

It is stated above that the "rotary part" of the slack adjuster is arranged on a pivoting shaft. This "rotary part" in an automotive slack adjuster of the type in question is normally a worm wheel; it may however equally well, depending on the design, be any force-delivering part, which performs its slack adjusting function by small rotational movement relative to the lever itself.

Preferably the design has to be simple and sturdy, and sensitive parts shall be protected from the harsh environment as much as possible. This is according to the invention obtained in that the base frame comprises two connected plates, the radial projection and the brake lever being arranged between these two plates, and in that a bracket is attached to the base frame, the brake cylinder being attached to a flange of this bracket and the slack adjuster being protected thereby.

It is important to obtain the required leverage between the slack adjuster and the brake lever but also — and perhaps even more important — to minimize the variations in the leverage at different degrees of wear of the brake pads and under different conditions. In this respect it is advantageous if the brake lever extends past and partly around the shaft and is actuated by the radial projection at the side of the shaft generally facing from the pivot point of the brake lever in the base frame.

It would be possible to allow the radial projection to act directly on the end of the brake lever, but a better solution from different points of view is obtained in that the brake lever and the radial projection are connected by means of connecting links, pivotally attached to the respective parts.

Brief Description of the Drawings

The invention will be described in further detail below reference being made to the accompanying drawings, in which Fig. 1 is a perspective and partly cut-away view of a disc brake caliper according to the invention, Fig. 2 is a top view of the same caliper with associated brake pads cooperating with a brake disc, and Fig. 3 is a side view of the same caliper to a somewhat reduced scale with a brake pad holder and with suspension means.

Detailed Description of a Preferred Embodiment

As most clearly illustrated in Fig. 1, but also in Figs. 2 and 3, a disc brake caliper according to the invention includes as main parts a generally U-shaped base frame 1, a bracket 2 attached to the base frame, and a brake lever 3 pivotally connected to the base frame by means of a pivot 4. This pivot 4 in the form of a screw joint also attaches the bracket 2 to the base frame 1 together with a screw joint 5.

This caliper is intended for suspension from a rail vehicle underframe or bogie (for example by means described below and shown in Fig. 3) in the vicinity of a brake disc 6, which is mounted on a wheel axle of the vehicle in a way known per se. With minor modifications of the caliper it may quite as well be intended for cooperation with wheel-mounted brake discs.

The free end portions of the base frame 1 and the brake lever 3, respectively, are provided with a pad holder 7 having a replaceable brake pad 8. In the shown case the two pad holders 7 are pivotally mounted in holes 9 in the base frame 1 and in a hole 10 in the brake lever 3. As a modification, however, the pad holder 7 at the base frame 1 may be fixedly attached thereto.

For the purpose of suspending the caliper each pad holder 7 is provided with a suspension link 11 (Fig. 3), whereas a central suspension bracket 12 is movably attached to an attachment 13 held to the base frame 1 by means of the screw joints 4 and 5. It is to be noted that these suspension means are only examples of different possible solutions and that the invention is only concerned with the caliper itself.

The base frame 1 is provided with a substantially centrally located pivot shaft 14, which is journalled in the two plates of the U-shaped base frame 1 and has a spined end extending out from the lower side of the base frame past the bracket 2.

On this splined shaft end is mounted an automatic slack adjuster 15, which is well known in the automotive brake art and is normally used as a brake force-transmitting and slack adjusting lever in an S-cam drum brake system for heavy road vehicles, such as trucks and buses.

For the proper understanding of the invention and the function of the disc brake caliper it is not necessary to have any specific knowledge about the design of the slack adjuster used. Accordingly no description thereof is given here. The slack adjuster can be defined as being of the rotary, lever type, as the slack adjusting function results in a small rotary motion of a splined worm wheel of the adjuster and thus in this case of the pivot shaft 14.

A pneumatic brake cylinder 16 is attached to a reinforcing flange 2' of the bracket 2, and its outgoing push rod 16' is connected to the end of the slack adjuster 15, as can be seen in Fig. 3.

The pivot shaft 14 is provided with a small fixed arm or radial projection 17 between the two plates of the base frame 1. This projection 17 extends towards the brake disc 6 in the initial position with new brake pads 8 in the caliper. When the pads are worn out, the projection 17 may have performed a turning or rotation of 90° in the clockwise direction, as viewed in Fig. 2, due to the slack adjusting function of the slack adjuster 15.

As appears, the brake lever 3 extends past and partly around the pivot shaft 14 and is connected to the radial projection 17 by means of connecting links 18.

At the admission of air under pressure to the brake cylinder 16 the pivot shaft 14 will be turned in the clock-wise direction by the slack adjuster 15 mounted thereon, and the projection 17 will push the brake lever 3 downwards, as viewed in Fig. 2, via the connecting links 18, so that the brake lever 3 — pivoting about the axis 4 — will apply the brake pad 8 against the brake disc 6, in which case the different parts of the caliper may have the position shown in Fig. 1.

The ratio between the effective lengths of the slack adjuster 15 and the radial projection 17 multiplied by the ratio between the effective lengths of the two arms of the brake lever 3 is the total ratio or leverage in the shown caliper. This total ratio may be considerable and is in the order of 4.5 with the shown geometry, whereas a direct connection of the brake lever 3 to the piston rod 16' of the brake cylinder 16 would have given a ratio in the order of 1.5 with otherwise unchanged geometry.

It is important to minimize the fluctuations in the ratio depending on the shifts in geometry during on the one hand one brake application, on the other hand different brake applications with different degree of wear of the brake pads 8. Such a minimizing is obtained by the shown geometry, especially at the radial projection 17 connected to the brake lever 3. A special difficulty in this respect is that when the brake pads 8 are gradually worn, the slack adjuster 15 will turn the shaft 14 in the clockwise direction (up to 90°) and thus move the initial position of the projection 17 further and further down as viewed in Fig. 2.

When the brake pads 8 have to be replaced after having been worn out, the original position of the radial projection 17 may be restored by manual rotation of a reset nut 15' on the slack adjuster 15.

Modifications are possible within the scope of the appended claims. Although the used automatic slack adjuster 15 is manufactured at comparatively low cost and may be regarded as a well functioning machine element, it may be replaced by a manual slack adjuster of the type more commonly used earlier in the automotive industry or even by a simple arm, if the slack adjusting function is not required at all.

Another modification would be to alter the means for transmitting the forces between the radial projection 17 and the brake lever 3. A cam arrangement replacing the connecting links 18 would be feasible, although it would be difficult to obviate excessive leverage fluctuations.

The pivot shaft 14 is said to be "centrally located" but may — as a further modification —

have another location in the base frame 1, which also instead of being U-shaped can consist of two connected plates or have a similar design.

Claims

1. A rail vehicle disc brake caliper, which includes a base frame (1) with a pivotally attached brake lever (3) and is to be suspended from an underframe or bogie of the vehicle, the end portions of the base frame and the brake lever, respectively, on either side of a disc (6) to be braked being provided with brake pads (8) on pad holders (7), a fluid operated brake cylinder (16), which acts on the brake lever and is attached to the base frame, and a slack adjuster (15) of the rotary, lever type arranged with its rotary part on a shaft (14) pivotally arranged in the base frame (1), characterized in that the free arm of the slack adjuster (15) is connected to the piston rod (16') of the brake cylinder (16) so that it both transmits the brake force and adjusts the slack and the shaft (14) is provided with a radial projection (17), which is force-transmittingly connected to the brake lever (3).

2. A disc brake caliper according to claim 1, characterized in that the base frame (1) comprises two connected plates, the radial projection (17) and the brake lever (3) being arranged between these two plates, and in that a bracket (2) is attached to the base frame, the brake cylinder (16) being attached to a flange (2') of this bracket and the slack adjuster (15) being protected thereby.

3. A disc brake caliper according to claim 1 or 2, characterized in that the brake lever (3) extends past and partly around the shaft (14) and is actuated by the radial projection (17) at the side of the shaft generally facing from the pivot point (4) of the brake lever (3) in the base frame (1).

4. A disc brake caliper according to any of the preceding claims, characterized in that the brake lever (3) and the radial projection (17) are connected by means of connecting links (18), pivotally attached to the respective parts (3, 17).

Revendications

1. Etrier de frein à disque de véhicule ferroviaire, qui comprend un bâti de base (1) sur lequel est articulé un levier de frein (3) et qui est destiné à être suspendu à un châssis ou boggie du véhicule, les parties extrêmes du bâti de base et du levier de frein, situées, respectivement, de part et d'autre d'un disque (6) à freiner, étant équipées de semelles de frein (8) sur des porte-semelles (7), un cylindre de frein (16) actionné par fluide, qui agit sur le levier de frein et qui est relié au bâti de base, et un régleur de frein (15) du type rotatif à levier, agencé de façon que sa partie rotative soit située sur un axe (14) monté de façon pivotante dans le bâti de base (1), caractérisé en ce que le bras libre du régleur de frein (15) est relié à la tige (16') du piston du cylindre de frein (16) afin qu'il, à la fois, transmette la force de freinage et règle le jeu, et l'axe (14) comporte une saillie radiale (17) qui est reliée en transmission de force au levier de frein (3).

2. Etrier de frein à disque selon la revendication 1, caractérisé en ce que le bâti de base (1) comprend deux plaques reliées, la saillie radiale (17) et le levier de frein (3) étant agencés entre ces deux plaques, et en ce qu'une console (2) est fixée au bâti de base, le cylindre de frein (16) étant fixé à une aile (2') de cette console et le régleur de frein (15) étant ainsi protégé.

3. Etrier de frein à disque selon la revendication 1 ou 2, caractérisé en ce que le levier de frein (3) s'étend au-delà et partiellement autour de l'axe (14) et est actionné par la saillie radiale (17) sur le côté de l'axe tourné globalement dans la direction s'éloignant du point (4) de pivotement du levier de frein (3) dans le bâti de base (1).

4. Etrier de frein à disque selon l'une quelconque des revendications précédentes, caractérisé en ce que le levier de frein (3) et la saillie radiale (17) sont reliés au moyen de biellettes (18) de liaison articulées sur les pièces respectives (3, 17).

Patentansprüche

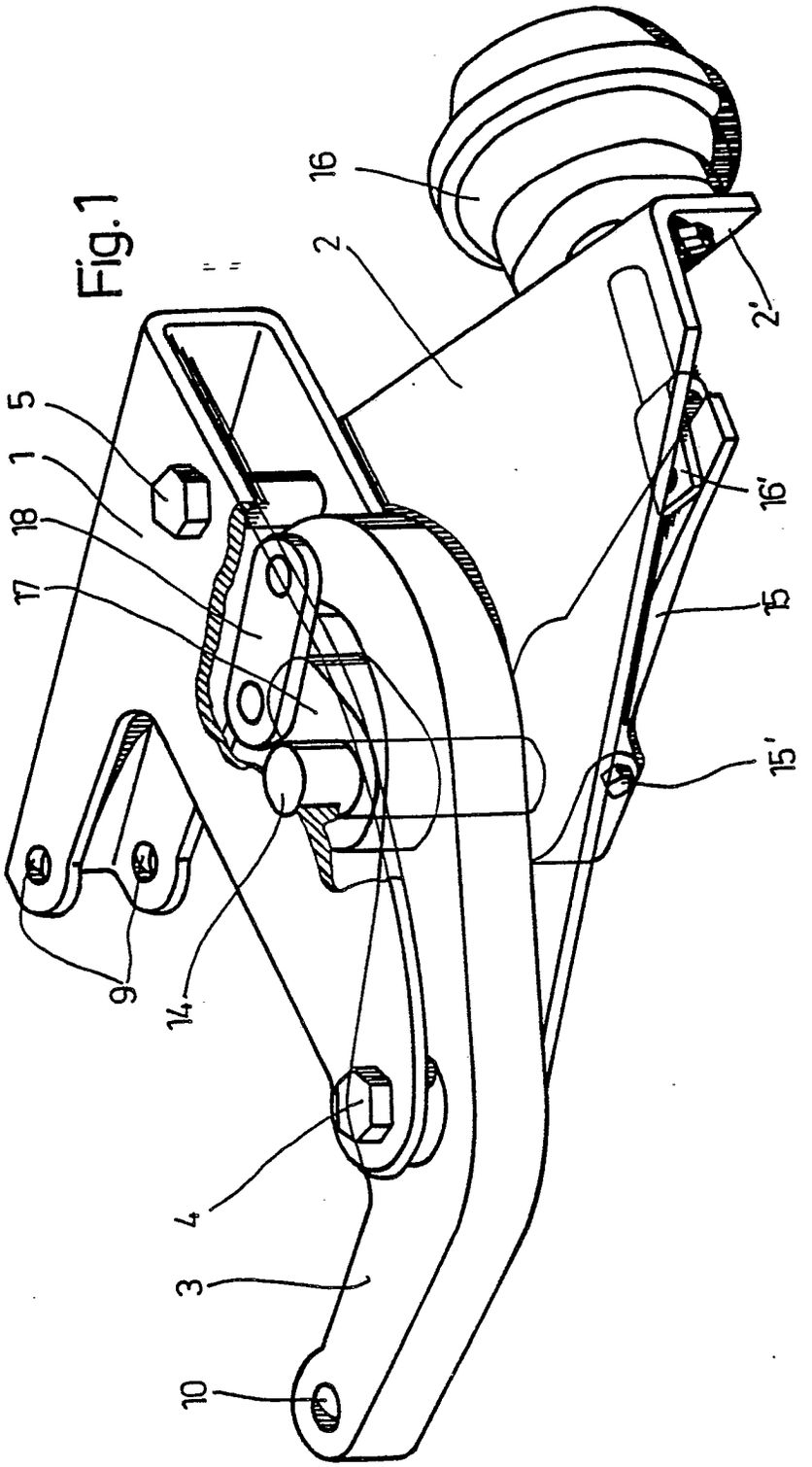
1. Bremszange für eine Scheibenbremse eines Schienenfahrzeuges, die einen Grundrahmen (1) mit schwenkbar angebrachtem Bremshebel (3), der am Rahmen oder Fahrgestell des Fahrzeuges aufzuhängen ist, wobei die Endabschnitte des Grundrahmens und des Bremshebels jeweils auf beiden Seiten einer zu bremsenden Scheibe (6) mit Bremsklötzen (8) auf Bremsklotzhaltern (7) versehen sind, einen fluidbetätigten Bremszylinder (16), der auf den Bremshebel einwirkt und am Grundrahmen angebracht ist, und einen Gestängesteller (15) vom Drehhebeltyp aufweist, der mit seinem Drehteil auf einer Welle (14) angeordnet ist, die drehbar im Grundrahmen (1) angeordnet ist, dadurch gekennzeichnet, daß der freie Arm des Gestängestellers (15) mit der Kolbenstange (16') des Bremszylinders (16) verbunden ist, so daß er sowohl die Bremskraft überträgt als auch das Spiel einstellt, und die Welle (14) mit einem radialen Vorsprung (17) versehen ist, der in Kraftübertragungsverbindung mit dem Bremshebel (3) steht.

2. Bremszange für eine Scheibenbremse nach Anspruch 1, dadurch gekennzeichnet, daß der Grundrahmen (1) zwei verbundene Platten umfaßt, wobei der radiale Vorsprung (17) und der Bremshebel (3) zwischen diesen zwei Platten angeordnet sind, und daß ein Träger (2) am Grundrahmen angebracht ist, wobei der Bremszylinder (16) an einem Flansch (2') dieses Trägers angebracht ist und der Gestängesteller (15) dadurch geschützt ist.

3. Bremszange für eine Scheibenbremse nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß sich der Bremshebel (3) an der Welle (14) vorbei und teilweise um die Welle (14) herum erstreckt und durch den radialen Vorsprung (17) an der Seite der Welle betätigt wird, die im wesentlichen vom Drehpunkt (4) des Bremshebels (3) im Grundrahmen (1) abgewandt ist.

4. Bremszange für eine Scheibenbremse nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß der Bremshebel (3) und der radiale Vorsprung (17) über Verbindungsglieder (18) verbunden sind, die drehbar an den jeweiligen Bauteilen (3, 17) angebracht sind.

Fig.1



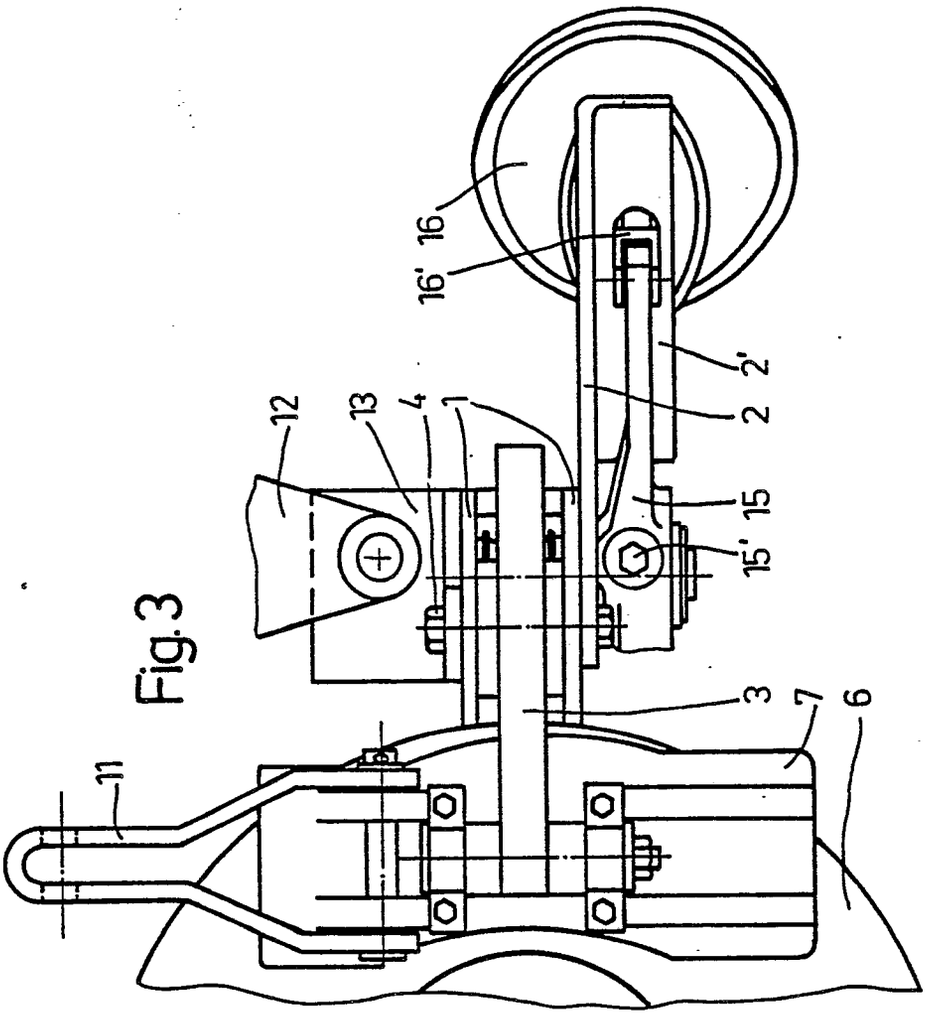


Fig.3

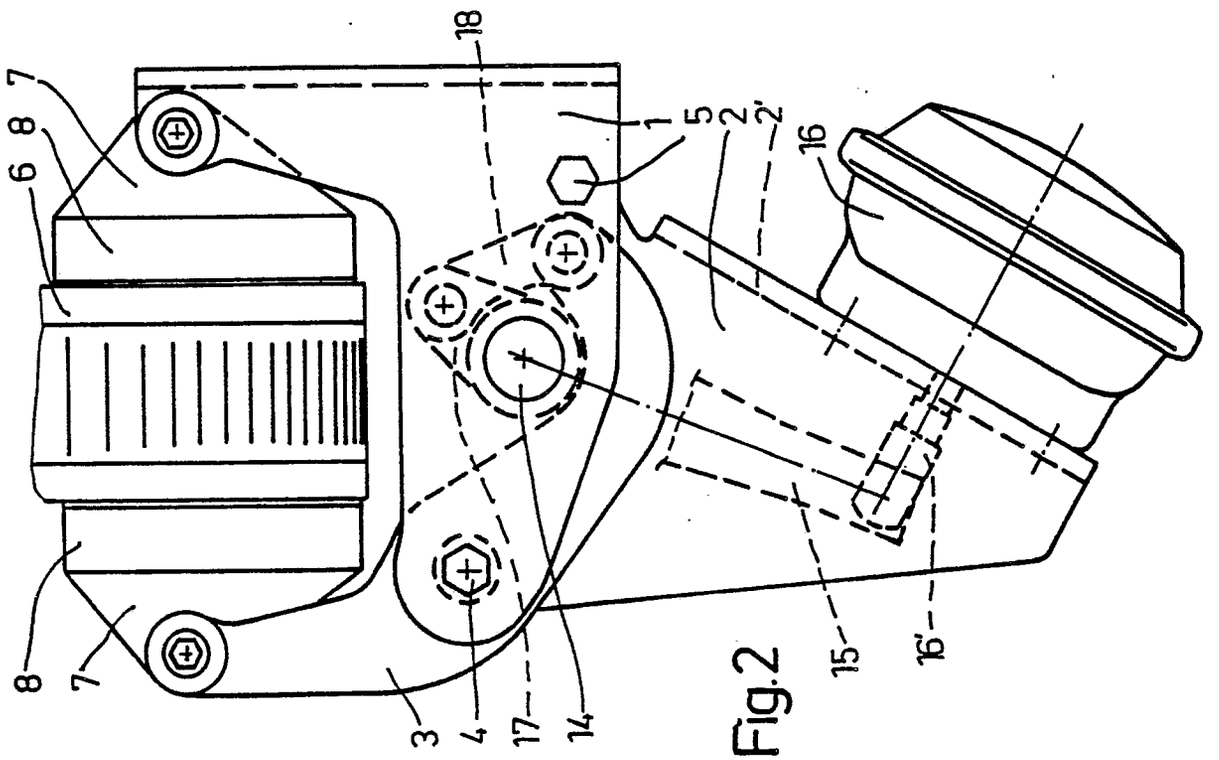


Fig.2